

# Claims

- [c1] A method of forming an injection molded part in a mold cavity comprising:
- charging a first volume of gas in a fixed volume reservoir;
  - introducing a first volume of plastic material into the mold cavity through a gas pin, said gas pin incorporating a temperature sensing device;
  - determining the temperature of said plastic material in the mold cavity;
  - introducing said first volume of gas into said first volume of plastic material when said temperature of said plastic material reaches a predetermined value, said first volume of gas forming a hollow cavity in said plastic material;
  - filling said mold cavity with plastic material;
  - injecting a second volume of gas into the hollow cavity in said plastic material;
  - allowing said plastic material to cool;
  - venting at least said second volume of gas from said plastic material; and
  - removing said cooled plastic material from said mold cavity.

- [c2] The method as described in claim 1 further comprising the steps of recharging said first volume of gas in said fixed volume reservoir.
- [c3] The method as described in claim 1 further comprising the step of repeating the molding cycle to form another injection molded part.
- [c4] The method as described in claim 1 wherein said first volume of gas has a first quantity of gas material at a first pressure and said second volume of gas has a second quantity of gas material at a second pressure, said first pressure is less than said second pressure.
- [c5] The method as described in claim 4 wherein said first pressure is insufficient to cause the gas to pass through said plastic material and into said mold cavity.
- [c6] The method as described in claim 1 wherein said introduction of a first volume of gas into the plastic material comprises operating a first valve mechanism to release said first volume of gas from said fixed volume reservoir.
- [c7] The method as described in claim 14 further comprising the step of varying the position of the temperature sensing device relative to the mold cavity in order to regulate the initiation of the introduction of the first volume of

gas.

- [c8] A system for forming an injection molded part in a mold, said system comprising:
- a mold having a mold cavity in the shape of the part;
  - an injection molding machine for injecting plastic material into the mold cavity;
  - a gas pin positioned in said mold for injecting gas into said mold cavity;
  - a sensing device positioned in said gas pin for determining the presence of plastic material injected into said mold cavity;
  - a fixed volume reservoir for introducing a first volume of gas into plastic material in the mold cavity;
  - a control mechanism for allowing gas from said fixed volume reservoir to pass into the mold cavity upon determining the presence of plastic material in the mold by said sensing device;
  - a supply of gas for introducing a second volume of gas into the plastic material in the mold cavity; and
  - a gas controller for use in introducing a second volume of gas into the plastic material.
- [c9] The system as described in claim 8 wherein said sensing device is a thermocouple.
- [c10] The system as described in claim 8 wherein said gas pin

comprises an outer body member and an inner shank member, and wherein said sensing device is positioned in said inner shank member.

[c11] The system as described in claim 8 wherein said sensing device is a fiber optic member.

[c12] The system as described in claim 8 wherein said sensing device is a temperature sensing device and measures the temperature of the plastic material.

[c13] The system as described in claim 12 wherein said control mechanism allows gas from said fixed volume reservoir to pass into the mold cavity upon measurement of a pre-determined temperature by said temperature sensing device.

[c14] A gas pin device comprising an outer body member and an inner shank member, said shank member being positioned inside said body member, the outside dimension of a first end of said inner shank member and the inside dimension of a corresponding first end of said body member creating an opening to allow passage of gas therethrough but not allow the passage of plastic material, and a sensing device positioned in said first end of said shank member for measuring the presence of plastic material contacting said first end of said shank mem-

ber.

- [c15] The gas pin device as described in claim 14 wherein said sensing device is a thermocouple and measures the temperature of the plastic material.
- [c16] The gas pin device as described in claim 14 wherein said sensing device is a fiber optic member.